A Novel Approach To Using Artificial Intelligence to Aid the Hearing and Vision Impaired

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Over 1.5 billion people worldwide experience hearing loss, and 2.2 billion have vision impairments. Both require assistive technologies; however, millions lack access due to cost. To address this, a low-cost AI-powered smart device was created to support them. This device enhances safety by alerting users to nearby hazards they may not notice. It uses machine learning-based image classification to detect objects. Trained with an open-source DFRobot library and modified by Yurui Qin, it recognizes common outdoor hazards like people, dogs, cars, trucks, motorcycles, and bikes. When an object is detected, an ultrasonic sensor measures its distance. If within range, a motor activates to alert the user. To improve awareness, the device uses a Morse code-like vibration pattern for alerts. All low-power components are housed in a compact 2.5×6.5×11cm case. The rechargeable battery lasts about 5 hours. To test accuracy and range, 80 trials were conducted for each object type at 5 and 10 feet. For human detection, the device was 98% accurate at 5 ft and 95% at 10 ft. Vehicle detection maintained 100% accuracy at both distances. For dogs, accuracy was 97% at 5 ft and 88% at 10 ft. The device successfully detected moving objects in 86 out of 90 trials and accurately identified objects within a 180° range under various lighting conditions. This device provides an effective way to assist individuals with hearing and vision impairments. The total cost is around $140, making it affordable and accessible to a wide range of users.

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